

What is claimed is:

1. A spinal fixation system comprising:
 - a bone anchor member for being secured to a vertebral bone of the spine and having an enlarged head at one end thereof;
 - 5 an elongate member for extending generally along the spine;
 - a coupling device for securing the elongate member relative to the bone anchor member;
 - a seat of the coupling device having a bore about which the seat extends and sized to allow the anchor member to extend through the bore in a plurality of orientations with the head engaged against the seat; and
 - 10 a cam lock member of the coupling device having a cam surface which cooperates to push the elongate member downward with the cam lock member being fixed against translation during turning thereof for clamping the head of the anchor member against the seat to fix the anchor member in one of the orientations thereof with the elongate member
 - 15 secured between the cam lock member and the anchor member head.
2. The spinal fixation system of claim 1 wherein the coupling device includes a coupling member having an internal lower surface on which the seat is formed and an upwardly extending internal surface with the cam lock member being fixed against
- 20 translation along the upwardly extending surface to keep the length thereof to a minimum.
3. The spinal fixation system of claim 1 wherein the cam lock member cams against the elongate member and the coupling device includes walls extending upward from the seat by a predetermined distance with the camming between the cam lock member and
- 25 the elongate member allowing the predetermined distance to be minimized for providing a low profile for the coupling device.

4. The spinal fixation system of claim 1 wherein the cam lock member has a generally annular body and the coupling device comprises a low profile coupling member having an internal lower surface on which the seat is formed and an upwardly extending annular side surface that fits about the annular body of the cam lock member with the annular body and annular side surface being free of threading for minimizing size of the coupling member.

5. The spinal fixation system of claim 1 wherein the cam surface has a predetermined configuration so that the cam lock member is rotated by approximately 100 degrees between locked and unlocked positions thereof.

6. The spinal fixation system of claim 1 wherein the elongate member is a spinal rod having a convexly curved surface, and the cam surface of the cam lock member is a bottom surface thereof which directly engages the rod surface and includes a concave surface portion for substantially mating with the rod surface in the unlocked position, and ramp surface portions on either side of the concave surface portion that cam against the rod surface as the cam lock member is turned from an unlocked position toward a locked position thereof.

7. The spinal fixation system of claim 1 wherein the elongate member is a spinal rod having a convexly curved surface, the cam surface of the cam lock member is a bottom surface thereof that includes a concave surface portion and ramp surface portions on either side of the concave surface portion, and

a saddle member of the coupling device including an upper cam surface and a lower concave surface with the upper cam surface configured to cooperate with the cam surface portions of the cam member for driving the lower concave surface into tight fitting engagement on the rod surface.

8. The spinal fixation system of claim 1 wherein the coupling device includes opposite side walls extending upwardly from the seat with the elongate member extending across the coupling device between the side walls, the cam lock member having a pair of lipped radial flanges and the side walls each including a recess
5 configured to receive a corresponding one of the flanges therein to keep the walls from spreading apart as the cam lock member is turned for pushing the elongate member downward.

9. The spinal fixation system of claim 1 wherein the coupling device includes a
10 generally yoke-shaped coupling member having opposite sidewalls spaced from each other and opposing slot openings therebetween through which the elongate member extends.

10. The spinal fixation system of claim 1 wherein the coupling device includes a
15 coupling member that is configured to allow the elongate member to be secured relative to the bone anchor member, the bone anchor member head includes a recess, and
a small insert received in the recess and having a substantially flat upper surface for engaging the elongate member with the insert sized so that the upper surface is disposed only slightly beyond the anchor member head, the insert being self-adjustable
20 in the recess to orient the upper surface to the position of the elongate member for maintaining maximum contact therebetween.

11. The spinal fixation system of claim 1 wherein the coupling device includes a
25 saddle member having a cam surface for cooperating with the cam surface of the cam lock member and an elongate member engaging surface that is pushed tightly against the elongate member with turning of the cam lock member to a locked position thereof.

12. The spinal fixation system of claim 1 wherein the coupling device includes a clamping member, the cam lock member cams against the clamping member, and the coupling device includes walls extending upward from the seat by a predetermined distance with the camming between the cam lock member and clamping member allowing the predetermined distance to be minimized for providing a low profile for the coupling device.

13. A spinal fixation system for fixing a spinal rod in a desired position relative to a patient's spine, the spinal fixation system comprising:

a bone anchor member for being secured to a vertebral bone of the spine;

a head at the proximal end of the anchor member having an upper recessed surface and a lower generally arcuate external surface;

a coupling member for receiving the spinal rod and including an internal seat surface and a central bore sized to allow the anchor member to extend therethrough in a plurality of different orientations with the arcuate external surface of the head bearing on the internal seat surface of the coupling member to allow the anchor member head to shift thereon;

a low profile insert having a substantially flat upper surface for engaging the spinal rod and an arcuate lower surface for adjustably bearing against the recessed surface of the anchor member head with the insert sized so that the upper surface thereof projects only slightly beyond the anchor member head to keep the profile of the insert to a minimum; and

a clamping member that clamps the rod against the flat insert surface to fix the anchor member head against the seat surface with the anchor member in one of the different orientations thereof.

14. The spinal fixation system of claim 13 wherein the anchor member head includes a retainer to keep the insert in the recess of the head.

15. The spinal fixation system of claim 14 wherein the anchor member comprises a bone screw having a threaded shank depending from the head, and the recessed head of the screw has an annular cup-shaped wall including an upper surface that has driving surfaces for driving engagement with a tool that turns the screw with the insert in the
5 recess thereof for threading the shank into a vertebral bone.

16. The spinal fixation system of claim 13 wherein the insert upper surface is narrower than the insert lower surface, the insert includes a shoulder between the upper and lower surfaces thereof, and
10 staked portions of the anchor member head that are fixed in interference with the insert shoulder to retain the insert in the head recess and spaced from the shoulder to allow pivoting of the insert in the head recess.

17. The spinal fixation system of claim 13 wherein the insert includes an enlarged
15 lower portion having the lower arcuate surface thereon, and a central projection extending upwardly from the lower portion and having the flat upper surface thereon.

18. The spinal fixation system of claim 13 wherein the coupling member has opposing slots sized to allow the spinal rod to extend therethrough with the insert
20 adjusting via sliding of the insert arcuate lower surface on the upper recessed surface of the anchor member head to keep the insert upper flat surface in maximum contact with the rod in any one of the orientations of the anchor member.

19. The spinal fixation system of claim 13 wherein the clamping member comprises
25 a cam lock member having a cam surface thereon that cams directly against the rod with turning of the cam lock member for pushing the rod tightly against the insert.

20. The spinal fixation system of claim 13 wherein the clamping member comprises a saddle member having an upper cam surface, and

5 a cam lock member axially adjustably connected to the saddle member and having a lower cam surface that cooperates with the saddle upper cam surface so that turning of the cam lock member toward a locked position thereof drives the saddle member axially toward the rod with the cam lock member staying axially fixed.

21. A spinal fixation system comprising:

a bone anchor member;

10 a spinal rod having a curved external surface;

a coupling device for securing the spinal rod relative to the bone anchor member;

a cam lock member;

opposite laterally spaced openings of the coupling device through which the spinal rod extends with the bone anchor member extending transverse to the rod; and

15 a bottom cam surface of the cam lock member that cooperates with the rod curved surface such that turning of the cam lock member causes the rod to be pushed downwardly toward the bone anchor member for being fixed in position relative thereto.

22. The spinal fixation system of claim 21 wherein the bone anchor member and coupling device are distinct components.

23. The spinal fixation system of claim 21 wherein the bone anchor member includes an enlarged head and a shank depending therefrom, and the coupling device includes a unitary coupling member having an internal lower seat surface on which the head can shift and opposing integral sidewall portions extending upward from either side of the seat surface with the bore extending centrally through the seat surface and sized to receive the bone anchor member shank extending therethrough in a plurality of

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orientations with turning of the cam lock member causing the head to be clamped against the seat to fix the shank in one of the orientations thereof.

5 24. The spinal fixation system of claim 21 further including a low profile anvil, wherein the bone anchor member includes a head with a recess formed therein, the recess receiving the low profile anvil therein.

10 25. The spinal fixation system of claim 24 wherein the low profile anvil has a top surface for engaging the external surface of the spinal rod, and the anvil is shiftable within the recess to orient the top surface of the anvil against the external surface of the spinal rod.

15 26. The spinal fixation system of claim 24 wherein the anvil is fashioned from a sphere so as to have a spherical portion received in and shiftable against the recess and to have a top surface positioned less than a full radius from the center of rotation of the anvil.

20 27. The spinal fixation system of claim 21 wherein the bone anchor member is a hook.

28. The spinal fixation system of claim 21 wherein the bone anchor member is fixed in a single orientation relative to the coupling device.

25 29. The spinal fixation system of claim 28 wherein the bone anchor member is integral with the coupling device.

30. A spinal fixation system for fixing an elongate member in a desired position relative to a patient's spine, the spinal fixation system comprising:

a bone anchor member for being secured to a vertebral bone of the spine;
a coupling member having an axis and an internal space for receiving the spinal
rod extending therethrough in a direction transverse to the coupling member axis;
a cap member for being turned about the coupling member axis to a locked
5 position thereof and locking the elongate member in the coupling member;

a saddle member disposed between the cap member and the elongate member for
being tightly engaged against the elongate member with the cap member in the locked
position;

10 a connector member distinct from the cap member and the saddle member for
keeping the cap member and saddle member assembled together and allowing the saddle
member to shift axially along the coupling member axis upon turning of the cap member;
and

15 cam surfaces between the cap member and the saddle member configured so that
turning of the cap member toward the locked position causes the saddle member to be
driven axially toward the elongate member without requiring axial movement of the cap
member.

31. The spinal fixation system of claim 30 wherein the connector member comprises
a spring clip member.

20 32. The spinal fixation system of claim 30 wherein the cap member includes a central
opening, and the connector includes flexible spaced prongs that resilient deform toward
each other as the prongs are inserted in the cap member central opening to permit
assembly of the cap and saddle members together.

25 33. The spinal fixation system of claim 30 wherein the connector member includes
an axially intermediate cam portion that frictionally holds the cap member and the saddle

member closely adjacent to each other and allows the saddle member to shift axially relative to the cap member as the cap member is turned.

5 34. The spinal fixation system of claim 30 wherein the coupling member comprises a pair of spaced sidewalls having internal recesses therein, and the cap member includes radial flanges for being received in the recesses to keep the cap member axially fixed as the cap member is turned to the locked position thereof.

10 35. The spinal fixation system of claim 30 wherein the cam surfaces comprise a bottom surface on the cap member and an upper surface on the saddle member.

15 36. The spinal fixation system of claim 35 wherein the upper surface of the saddle member has an elongate configuration extending within the internal space of the coupling member.

37. The spinal fixation system of claim 30 wherein the coupling member and the cap member have detents therebetween to provide a tactile indication of different rotary positions of the cap member during turning thereof.